Learning goals and objectives:
This course examines disparities in representation in the scientific community, issues facing different groups in the sciences, and paths towards a more inclusive scientific environment. We will delve into the current statistics on racial and gender demographics in the sciences and explore their background through texts dealing with the history, philosophy, and sociology of science. We will also explore the specific problems faced by underrepresented and well-represented racial minorities, women, and LGBTQ community members. The course is reading intensive and discussion based.

By the end of the course, you will
- be a critical reader of literature on race and gender in the scientific community;
- have a broad understanding of how culture affects science;
- identify challenges faced by different groups and understand some of the psychological and sociological mechanisms underpinning these challenges;
- have established an understanding of implicit bias, stereotype threat, and their effects;
- be able to design strategies for fostering more inclusive learning strategies and mentoring conversations.

Course format:
Course enrollment is limited, since class time will be largely discussion based. I expect a dynamic and interactive environment during which we will discuss and reflect on the reading assignments. We will complete written reflections on our reading before and brief essays on our discussions after each class. Each student will lead a discussion once during the semester and write a brief essay about their experience. The final project will be done in small teams: projects may involve further research into topics covered in class, exploring additional topics not discussed in class, the development of handouts that summarize inclusive advising and teaching strategies and plans for distributing these, or engaging in advocacy activities: the expected outcomes of the final project include an initial proposal on which teams will receive feedback from the entire class, a written final report (possibly with additional materials developed as part of the project), and a presentation.

Prerequisites:
Preference will be given to STEM concentrators and to students interested in concentrating in STEM fields. Students should have taken a WRIT course and ideally have experience with reading-intensive courses.

Topics:
- Facilitating and participating in discussions; share our goals for this course
- Statistics regarding demographic representation in the scientific community
- Philosophy of science
- History of science development
- “Scientist” as an identity
- Implicit bias, imposter syndrome, stereotype threat, and how they affect individuals
- Challenges faced by underrepresented and well-represented minorities
- Gender: women as scientists in the past and present
- LGBTQ scientists and science
- Science education and its impact on race and gender dynamics
- Inclusive advising, mentoring, teaching, and learning.
Time expectations:

- Class time: 39 hours
- Reading for class (6hr/week): 78 hours
- Reading reflections (2hr/week): 26 hours
- Discussion leader: 4 hours
- Final project: 35 hours

Total for semester: 182 hours

Assessment:

This course is mandatory S/NC. The assessment is broken down into the following components:

- Course attendance: 6%
- Self-assigned participation score: 12%
- Instructor-assigned participation score: 12%
- Reading reflections: 30%
- Discussion-leader preparedness: 5%
- Small-group final project: 35%

The grade for the final project is broken down into the initial project proposal (5%), an intermediate written report that summarizes the research done (5%), the final written report (20%), and a presentation (5%).

Accommodations for students with disabilities:

If you need accommodations for classes, assignments, or exams, please contact me as soon as possible. Please also contact the Student and Employee Accessibility Services (by phone 401-863-9588 or online at http://brown.edu/Student_Services/Office_of_Student_Life/seas/index.html)

Diversity and inclusion statement:

I would like to create a learning environment for you that supports a diversity of thoughts, perspectives, and experiences, and honors your identities (including race, gender, class, sexuality, religion, ability, ...). To help accomplish this:

- If you have a name and/or set of pronouns that differ from those that appear in your official Brown records, please let me know!
- If you feel that your performance in the class is being impacted by your experiences outside of class, please do not hesitate to come and talk with me. I want to be a resource for you. If you prefer to speak with someone outside of the course, Dean Bhattacharyya (Associate Dean of the College for Diversity Programs) is a great resource.
- I am still in the process of learning about inclusion and diverse perspectives & identities. If something was said in class (by anyone) that made you feel uncomfortable, please talk to me about it.
- As a participant in course discussions, you should also strive to honor the diversity of your fellow classmates.

Anonymous feedback: You can provide anonymous feedback for this class here:

[Anonymous feedback link]

The fine print ...

- Canvas: All announcements and assignments will be posted exclusively on Canvas: please make sure you receive notifications from Canvas so that you stay informed of announcements and deadlines.
Reading List

Day 1 (Tu): Facilitation & Safe Space

Description: To discuss how can we create a safe and productive space for sharing personal narratives, the readings will cover facilitation skills, with a special focus on conversations around race. We will also begin to share personal experiences with the issues that will be explored throughout the semester, particularly, how race and gender have played a role in our participation in the sciences.

Guiding Questions: What does a safe space look like? What would you like to see in this space in order to feel encouraged to share your personal experiences? What can each of us do to create an atmosphere that is comfortable for all despite our differences?

  [This is the pre-reading assignment for a workshop on designing and facilitating conversations on about racial justice work that fosters authentic engagement]
  [This is a report on the Storytelling Project Model, which links research to practice through the development of a curriculum to teach about racism and social justice]
  [This short handout discusses both the logistical and emotional aspects of facilitating a productive discussion]
  [This handbook discusses 15 tools for individuals and groups seeking to organize a community seeking to solve some of its most pressing issues. A particular emphasis is placed on issues relating to race]
  [This article discusses strategies for encouraging participation and fostering holistic learning even in the presence of complex and highly emotional issues]

Day 2 (Th): Statistics/ Background

Description: This class is devoted to familiarizing ourselves with data surrounding issues of representation, so that we are all well-equipped with the most up-to-date facts prior to diving in to more theoretical concerns. We will be skimming an extensive report put out by the National Science Foundation, as well as reading an article about a class similar to this taught here at Brown that began much of the discussion around these issues here. We think that grounding ourselves with data early in the semester will allow us to put future readings in perspective and better evaluate claims for the rest of the semester. It will also help us learn how our experiences, examined in Day 1, fit in to the broader statistical picture.

Guiding Questions: Who collects these numbers? Why? How are the data biased? What are different ways we could have structured this class? What are the benefits/drawbacks?

  [This article describes a class similar to this class taught in the 80s at Brown by Professor Fausto-Sterling, including their objectives and results]
Day 3 (Tu): General Philosophy of Science

**Description:** In this class we will present an overview of the philosophy of science. We will discuss the concepts "normal science", "objectivity", and "scientific revolutions". This discussion will lay a basic groundwork for understanding the sociology of the scientific process. We will read Francis Bacon's *New Atlantis* in order to explore the idea of big science as a utopia.

**Guiding Questions:** What is the nature of normal science? To what extent can science be objective? Are scientific revolutions necessary?

- Kuhn, Thomas S. *The Structure of Scientific Revolutions*. pp. 10-34, 92-110
  [This is a classic work in the history of science, which offers a theory for how scientific revolutions happen and explains the structure of the scientific community]
  [Longino discusses the manner in which context must inform scientific inquiry]
  [Bacon describes a future guided by science as an enlightened utopia]

Day 4 (Th): Feminist Philosophy of Science & Diversity Arguments

**Description:** In this class we will discuss several theoretical arguments from feminist philosophers of science concerning the makeup of the scientific community and its ramifications for the authority of “objective” scientific inquiry. This day is meant to build upon the previous day's discussions of general theories in the philosophy of science by looking at how feminist scholars have responded to these problems with an eye to gender and other forms of difference. This will aid our analysis of the history and culture of science in the coming days by giving us the tools to look at these issues from a feminist analytical lens.

**Guiding Questions:** What do feminist philosophers of science have to say about how science should be conducted? How do feminist envisionments of the proper way to conduct science both overlap with and build upon more mainstream theories in the philosophy of science? How do these theorists envision the relationship between feminist theory and scientific practice (and do you agree with what they have to say about this)? What implications do these theories have for the ideas of “objectivity” and “good science?”

  [http://www.andrew.cmu.edu/course/76-327A/readings/Harding.pdf]  
  [This piece explores the implications of science for feminism, and the implications of feminist theory for scientific theory and practice]
  [Haraway provides her vision for feminist science, critiquing masculinity]
  [This later piece by Harding prompts us to pay close attention to the idea of “objectivity” and the implications of the makeup of the scientific community for the productive of “good” and “objective” science]
Day 5 (Tu): How Science Developed

**Description:** We investigate how science developed, focusing on accounts of the people who developed it, paying special attention to who they are and how they are described in relation to the social circumstances of their time. This week will highlight how science has certain cultural perspectives "built-in," and how it is approached differently by people from different cultures.

**Guiding Questions:**
1. How did ideas about who could be a scientist develop? How was this tied to race, class and gender?
2. How did a scientist’s job description evolve over time?

  [This is a collection of essays about the importance of culture upon science. Specifically, it focuses on how non-Western European cultures interact with science and how their own sciences differ]

Day 6 (Th): The Scientist Identity Today

**Description:** This class will focus its discussion on the Scientist Identity today and specifically how that identity affects identities of race and gender and vice versa. We will explore the sometimes alienating nature of science (and higher education) and how it can form divides within and between communities. We will be reading case studies and talking to academics (professors and postdocs) that include scientist as a part of their identity.

**Guiding Questions:**
1. Is “scientist” an identity? How does claiming or rejecting this identity interfere or strengthen other identities? What are the stereotypes of being a scientist and how do they interact with other stereotypes? Do scientists have a culture? Is this culture western/white/male/cis or reflective of who is in the community?

  [This article explores how language can contribute to an equitable learning environment]
  [This study looked at interpersonal relationships between ethnic minority students in science classrooms]
  [This press release discusses how the typical identity of a computer scientist switched from female to male]
  [This study provides evidence for gendered stereotypes about science ability]
  [Archer explores how children’s interest in science develops over time]
  [This article looks at the manner in which scientific identity is formed for underrepresented groups]
Day 7 (Tu): Stereotype threat

**Description:** A class devoted entirely to issues involving stereotype threat and imposter syndrome: two issues governing the psychology of being underrepresented; they lead to underperformance by students in the sciences as well as in other areas in life. We will use Claude Steele’s *Whistling Vivaldi*, perhaps the most influential book on the subject of stereotype threat, to introduce us to the concept, its effects, and varying methods of reducing this threat in classrooms.

**Guiding Questions:** What is stereotype threat? Who is impacted by stereotype threat, and how? How does this threat shape our identities? What can be done to reduce stereotype threat?


  [This book is considered the leading work on stereotype threat, the experience of anxiety in a situation in which a person has the potential to confirm a negative stereotype about his or her social group. The selections listed here introduce the concept of stereotype threat, give evidence for its existence, discusses how it ties in to academic performance, and provides potential solutions to students’ anxiety]

  **Selections:**
  - Chapter 1: At the Root of Identity, p1-15 (15 pgs)
  - Chapter 2: Identity and Intellectual Performance, p16-43 (27 pgs)
  - Chapter 9: Reducing Identity and Stereotype Threat: a New Hope, p152-190 (38 pgs)
  - Chapter 10: The Distance Between Us: The Role of Identity Threat, p.191-210 (19 pgs)

Day 8 (Th): Underrepresented minorities

**Description:** We are going to look at three major groups of underrepresented minorities (URM): Black students, Latin@ students, and Native American students, to examine some of the unique challenges students identifying with any of these groups face. Examining each group in depth will lend us a better idea of the systemic problems that lead to the dearth of URMs in the sciences..

**Guiding questions:** What are some similarities/differences in the struggles/obstacles that students from these different URM groups face today? What historical/contemporary social and institutional factors play a role in these struggles/obstacles? How were the perspectives of scholars who self-identified with the racial/ethnic groups they wrote about different from those who did not? What assumptions were made about Black, Latin@, and Native American students in each of these readings? Are there students within each defined racial/ethnic group explored with these readings that were erased/may have different experiences from the ones the authors considered in their texts? Are there specific arguments from any of today’s readings that you found especially compelling, or arguments you found problematic? What are some things today’s readings’ analyses in general?


  [This articles discusses the degrees of underrepresentation at different levels of education of minority groups to better understand and provide solutions for the underrepresentation of certain minority groups in STEM fields]

**Black students:**


  This article discusses how the "science for all" ideology that has shaped education reform for decades fails Black students in the United States, and argues for reforms that are historically and socially informed]

No. 6, pp. 691-715. 20 pages

This study focuses on 11 Black undergraduate seniors in a biology degree program at a predominantly white research institution in the southeastern United States, and recounts their experiences and what factors they think contributed to their place in college.

**Latin@ students:**
- Villarreal, Rebecca (2012). Charting a Course towards Latino Student Success in Science, Technology, Engineering and Mathematics. University of Maryland. 17 pages
  [This paper discusses key factors necessary to the success of Latin@ students in the STEM fields]
  [This paper addresses the fact that Latin@s are currently underrepresented in STEM fields, and gives possible solutions to these issues]
  [This article discusses the necessity of the concept of intersectionality for thinking about why certain social groups – particularly Latin@s in this case, but not confined to them only – are underserved by our educational system]

**Native Students:**
  [This is a paper written by a Native American woman about the absence of Native Americans from postsecondary education, and the ways in which the Western school system has failed Native students]
  [This is a chapter about the different factors that affect the success of Native students in higher education, particularly pre-higher education disparities between Native students and well-represented populations]
  [This is an article discussing the integration of traditional ecological knowledge, an often ignored body of knowledge, into biological education to be more inclusive to indigenous, non-Native ways of thinking]

**Day 9 (Tu): Underrepresented minorities**

**Class description:** Today’s class will consider how issues concerning URM (underrepresented minorities) are framed, and how the way we frame conversations surrounding these issues could affect possible policies and other solutions devised. We will also consider what narratives are lost from the ways research on URM is conducted, and the consequences that come with grouping/not grouping URM together.

**Guided questions:** What are common ways in which we currently think about the differences in academic, as well as the “achievement gaps” that exist between URM and WRM/white students? What are some problems associated with how we commonly think about these issues? Are there better ways to consider these issues? How are the possible solutions to amending these “achievement gaps” affected by the ways we frame conversations around these gaps? What do we gain from thinking about URM as a cohesive group? Likewise, what do we lose from grouping all URM together (consider last class’ readings)? Furthermore, what are some problems associated with the fact that women of color are typically grouped together with URM in general? Are there specific arguments from any of today’s readings that you found especially compelling, or arguments you found problematic? What are some things today’s readings’ analyses in general?

Day 10 (Th): Gender: Historical Perspective

**Description:** The class will focus mainly on the extent to which women have contributed to the scientific community and how they made these contributions in the early 20th century starting with Marie Curie. We will read texts that explore these topics and ideas from leading experts in the field (such as Margaret Rossiter and Londa Schiebinger), and these will help inform our understanding the origins of some of the things that women in modern science experience.

**Guiding Questions:** What were the roles that women played in science in the early 20th century? Who were the major women scientists in this time period? What were the difficulties they faced in terms of either being able to do work or be recognized for the work they do? How were strategies they used to overcome these obstacles? What are some similarities to today?

  - Section 2: p.117-128 (11 pgs)
  - Section 3: p.201-216 (15 pgs)
  - Conclusion: p.285-292 (7 pgs)
  - Schiebinger discusses how gender shapes knowledge and the role of women in the Enlightenment period

Day 11 (Tu): Gender: Women as Scientists Today

**Description:** This class will focus on the role of women in the sciences from 1970 to the present. We will work with historical as well as statistical texts to gain an appreciation for the place that women occupy in the sciences as well as struggles that they face in the scientific community. We intend to back up narratives and historical studies with empirical evidence spanning areas as diverse as Ph.D. program dropout rates, hiring bias, funding disparities, and publishing bias.

**Guiding Questions:** What are the three greatest barriers to women in the sciences? How can we go about helping women to surmount these barriers effectively?
Day 12 (Tu): LGBTQ Scientists & Science

**Description:** After discussing gender and the experience of women in science, we felt it would tie in nicely to have a day devoted to LGBTQ science and scientists. Some of the same assumptions and power dynamics that affect the experiences of women in science are relevant here, so it is appropriate that this day come after our discussions of gender in science. This day also marks a transition to discussion of groups for whom the academic literature regarding the groups participation in science is less robust than for groups previously discussed. This day will focus on the experience of LGBTQ people in the scientific community. The primary focus will be on the experience of queer scientists themselves, but there will also be attention paid to the ways that scientific research has and does conceive of differences in gender identity and sexuality, and the implications that this has for LGBTQ scientists. We will read theory, as well as magazine articles, personal accounts, and ethnography, in order to give insight into the interactions between the institution of science and LGBTQ people.

**Guiding Questions:** How do assumptions about sexuality and gender identity play out in scientific research? What implications does this research have for LGBTQ scientists and lay people? What is the experience of being an out LGBTQ scientist like today? What can be done to improve the situation for LGBTQ people in the sciences?

  [This reading examines the centrality of sex, gender, and sexuality to the theory of human behavior and practice]
  [This article discusses the experiences of LGBT scientists in dealing with the inherent heteronormativity of the scientific community]
  [This article explores the ways that LGBT students at a major research university experience and navigate the culture of their engineering community]
  [This article discusses the personal experiences of Professor Ben Barres, a trans* person who speaks about his experience as both a woman and a man in the scientific community]

Day 13 (Th): Well-Represented Minorities
**Description**: In this week, we will examine the experience of groups that are minorities in America, but are relatively well represented in the scientific community, focusing specifically on Asian and Asian American scientists. We will also look critically at the scholarship that has developed around representation in the sciences, of the type we have been reading in weeks prior.

**Guiding Questions**: How did the myth of the model minority developed? How has it affected Asian and Asian American scientists? Who is “lost” in the Asian and Asian American label?

  [Teranishi’s book relates the experience of Asians in modern American academia, and notes their importance to the system’s function]
  [This is the original article which first coined the term “model minority”]
  [Lee examines the historical roots of the model minority myth, and its pervasive effects]
  [Museus looks critically at the effects of the model minority myth in higher education research]
  [Samura investigates the race and space as it relates to Asian American identities in higher education.]

**Day 14 (Tu): Well Represented Minorities (Continued)**

**Description**: We will continue our study of well represented minorities by looking at minority scientists more broadly, and also focusing on recent quantitative studies that provide evidence for significant bias against Asian and Asian American scientists.

**Guiding Questions**: What are the conditions like today for well represented minorities in the sciences? What do these studies look at, and what do they ignore? What policy recommendations could positively affect the lives of Asian and Asian American scientists?

  [This article uses first hand experiences of faculty of color, examining their experiences of teaching, mentoring, collegiality, identity, service, and racism]
  [This second Teranishi article looks quantitatively at Asian Americans and Pacific Islanders’ experience in higher education]
  [This detailed article examines the climate for women in academic psychology at multiple professional levels]
Day 15 (Th): Science education (theory)

**Description:** We will use this class to critically examine the way in which educational practices affect racial and gender dynamics in the classroom. We accomplish this by reading theories of anti-oppressive education and then two pieces that apply that theory to math education, one at the middle school level focusing on race and one at the undergraduate level focusing on women. We will look at the classroom as a comprehensive whole looking at interactions between teachers and students (two-way interactions) and between classrooms and educational systems.

**Guiding Questions:** How does the teaching of science and math affect the practice of science and math? What aspects of a classroom environment promote diversity and encourage women and people of color pursue further study? In what ways can classrooms themselves be oppressive?

- Paulo Freire. Pedagogy of the Oppressed. (44 pages)
  [This foundational text proposes a new pedagogical paradigm in which the learner is treated not as an “empty vessel” but as a co-creator of knowledge. The paradigm is presented and discussed within a framework that regards traditional pedagogy as fundamentally oppressive]
  [This article examines the four major approaches that educational researchers have taken in addressing oppression in a pedagogical context]
  [This article addresses concrete approaches to improving gender issues in mathematics education at the undergraduate level]
- Robert Moses and Charles Cobb. Radical Equations: Civil Rights from Mississippi to the Algebra Project. (Ch 1: Algebra and Civil Rights?, Ch 2: Learning from Ella: Lessons from Mississippi, Ch 5: Pedagogy: The Experience of Teachers and Students) (90 pages)
  [This book discusses the Algebra Project, a model for constructing a community-based solution to the inequality-perpetuating problems with math and science education in American schools]

Day 16 (Th): Science Education (Practice)

**Description:** Building off of the previous day’s discussion, we will examine more practical issues in education on this day, skimming large reports as well as reading involved case studies on issues of science education, inequality, and calls for reform.

**Guiding Questions:** How is science taught? How does who is teaching science influence science education? How does who is being taught influence science education? Consider ways in which these influences are both just and unjust.

  [This chapter, Kozol provides a case study of public education in New York, contrasting the classroom experiences in more and less affluent communities]
Day 17 (Tu): Science Communication

Description: The focus of this class will be on science communication and discussion of the responsibilities scientists may have to communicate their own research. Prof. Cornelia Dean will lead this discussion as we explore the importance and effective methods of science communication. This discussion precedes the initiation of our final group projects, and the topics of discussion may prove useful to the facilitation of the projects.

Guiding Questions: What does it mean to be an effective science communicator? Is communication a responsibility for scientists? What can come from effective science communication? Is science communication the answer to improving science literacy in society? Will increasing science literacy help encourage diversity in the sciences?

  [A reporter asked a number of prominent educators the question “How would you reform science education?”]
  [This article provides a broad overview about recent scholarship on the potential benefits of single-gender education]
  [Churney examines claims that single sex schools lead to broader STEM participation among women]
Day 18 (Th): Policy in the Past

**Description**: This day will focus on recent efforts by governmental and institutional entities to design and implement policies to effect change in the areas we are studying. The readings below examine the design, implementation, and effects of said policies. Here, we allow governmental initiatives to include local, state, and national level efforts, and institutional initiatives to include public and private universities, funding organizations, and industry.

**Guiding questions**: What approaches have been taken in the past to combat these issues? Who have been the primary actors? What have been the strongest driving forces? What strategies (or types of strategies) have been most successful? How can these strategies be improved and retooled for the future?

  [This book discusses why increasing the number of women and minorities in STEM is crucial to a nation’s economic performance and standard of living. It also presents concrete examples of actions that have been successful at improving representation]

  [This article discusses the policies of the European Commission from 1999-2009 that sought to increase the participation of women in STEM fields]

  [This review article discusses 10 intervention strategies that have been shown to be effective in increasing diversity in STEM fields]

  [This article discusses the results of controlled experiments that found that certain policies could improve issues of gender representation without reducing overall efficiency]

Day 19 (Tu): Policy in the Present and Future

**Description**: This day will build on the previous day’s discussion to examine policies that are currently in place, as well as new policies and structures that have been designed or proposed so recently that their effects on inequality and representation remain unknown.

**Guiding questions**: What strategies are being employed today? How are these strategies similar to and different from strategies used in the past? How can different strategies, each with their own pros and cons, be synthesized to form cohesive action plans?

  [This article discusses efforts being made to expand the existing law Title IX (traditionally associated with athletics) to issues of women in STEM]

  [These documents discuss an initiative by the United States Department of Energy to create a sustainable model for
connecting stakeholders and addressing the challenges facing minorities in STEM fields and energy economic participation

  [This report describes the ADVANCE initiative, a wide-ranging program of the National Science Foundation that seeks to increase the representation and advancement of women in the academic STEM community]

  [This article discusses several grassroots initiatives for improving gender and racial barriers to participation in stem fields]